

### REMARKS

Reconsideration of the present application is requested. Applicant appreciates the withdrawal of the rejection in view of the patent to Lum in light of Applicant's prior arguments. For the reasons set forth below, it is believed that the rejections in the present Office Action should also be withdrawn.

All of the claims have been rejected as obvious in view of the patent to Hall in combination with the secondary references of Lum, Brands and Rodabaugh. The patent of Rausch was added in the rejection of claims 9-18, the Komiyama reference was combined in the rejection of claims 20-27, 37 and 43, and both Rausch and Komiyama were added in the rejection of claims 28-36. It can first be noted that the independent claims 1 and 39 are purported to be obvious in view of a combination of four references. Although certainly not dispositive, the fact that elements of Applicant's claimed invention were extracted from four references belies any claim of obviousness.

There is no suggestion for making this four-way combination. Moreover, elements of these references have been inappropriately combined. In part, it is believed that the error in the rejection of independent claims 1 and 39 is based on an incomplete understanding of the differences between passivation (as performed in Applicant's invention), phosphating (as described in Lum and Brands), and barrier coating of metal surfaces (as disclosed in the Hall patent). Although these activities possess a common goal of imparting corrosion protection, they involve completely different mechanisms to achieve different surface characteristics for different end uses .

#### Background

The term passivation refers generally to those metals or metal alloys, most notably aluminum and stainless steel, which form a protective oxide layer under normal atmospheric conditions that resists the electrochemical process of corrosion. Stainless steel owes its superior corrosion resistance primarily to the presence of chromium in the alloy. When stainless steel is exposed to air or other chemical oxidizers, a mixed chromium/iron oxide is formed that is

extremely robust and resistant to corrosion. It is well known that stainless steel alloys with higher chromium content possess greater corrosion resistance because the oxide that is formed has a higher concentration of chromium. The degree of passivation of an alloy is quantified by the chromium to iron ratio within this external oxide layer; the higher the ratio, the more corrosion resistant the layer. 'Chromating' is a well known industrial process that takes advantage of the special nature of chromium oxide to impart corrosion resistant properties to a variety of different metal substrates through application of a chromium oxide layer. Importantly, the passivating oxide layer on stainless steel is an inherent part of the alloy and not a superficial coating that can be applied or removed. The end product has the appearance and surface characteristics of bare steel.

In contrast, phosphating and barrier coatings alter the appearance and surface characteristics of metal products completely. Phosphate coatings, including zinc, iron and manganese phosphate, are examples of what are referred to as 'conversion coatings' that convert the surface of the metal to a different chemical entity. Phosphate coatings can be crystalline or amorphous, produced in a variety of colors and thicknesses, and all result in the chemical alteration the metal surface. These coatings help to inhibit corrosion by resisting the passage of current that ultimately leads to corrosion, and can also be useful as carrier coatings for lubricants and as primers for paint. Suitable substrates for phosphating include iron, carbon steel, zinc/galvanized steel, and cadmium (and to a lesser extent aluminum and magnesium). However, stainless steel does not react fast enough under acidic conditions to allow a phosphate layer to form. Thus, it is well known that stainless steel is not well-suited for any type of phosphating process.

Like phosphate coatings, barrier coatings also alter the surface of metals and metal alloys. As the name implies, barrier coatings resist corrosion by preventing water and electrolytes from contacting the surface of the substrate. Barrier coatings are typically organic in nature and include paints, lacquers, powder coat, latex and acrylic polymers, copolymers, etc., as well as processes

like citric and oxalic acid treatment of steel. Unlike phosphate coatings, barrier coatings have been developed that are suitable for all types of metals and metal alloys, including stainless steel. Still, phosphate coatings obviously all share the common trait of chemically altering the surface characteristics of the substrates.

It is important to note that passivating is not coating to persons of skill in the art. Thus, the statement in the Office Action that "the coating of metal surfaces as taught by Hall reads on the claimed passivating step" is entirely inaccurate and an improper foundation for rejecting the claims of the present application.

#### The Present Invention

The present invention falls under the category of stainless steel passivation. It provides a method by which a relatively low chromium-containing alloy (i.e. 409SS) can be passivated to an extent that it has a chromium to iron ratio in the oxide layer that exceeds what is commonly found in very expensive, high chromium-containing alloys (i.e. 304SS and 316SS). Thus, a less expensive stainless steel can exhibit the corrosion resistance of a more expensive stainless steel following treatment by the present invention. Furthermore, this enhanced passivation can be achieved while eliminating dangerous and environmentally hazardous nitric and hydrofluoric acid, which are still the most common method for descaling and passivating all grades of stainless steel. Although other methods exist to descale stainless steel using alternative chemistries (i.e. hydrochloric or sulfuric acid and hydrogen peroxide), none provide a method for enhanced passivation as contemplated by the present invention.

#### The Hall Patent

The Hall patent discloses to an acidic aqueous coating composition containing an organic coating-forming material, and the stabilization of said formulation. Hall very clearly expresses that the disclosure "relates to the application of coatings to metallic surfaces." Col. 1, lines 15-16. In one embodiment of the method disclosed in Hall an organic styrene-butadiene

copolymer coating is applied to the surface of steel substrates. See, col. 1, lines 28-32. The primary object of Hall resides in finding that "the stability of acidic aqueous **coating compositions** ... can be maintained by treating the **coating composition** with an ion exchange material which removes from the composition metallic ions which otherwise cause the composition to become unstable." Col. 2, lines 23-29 [emphasis added]. The common components relied upon in the Office Action are part of the organic coating material, not a passivating composition.

It can further be noted that Hall does contemplate that nitric acid is a preferred oxidizing agent within the coating composition, which is contrary to Applicant's claimed invention requiring the absence of nitric acid. Ultimately, though, the Hall patent falls under the category of organic barrier coatings and is completely unrelated to passivation technology or the present invention. There is nothing in Hall or any of the other references of record that would guide a person of ordinary skill in the art of passivating to turn to the organic surface coating of Hall for answers to passivating low-chromium stainless steel.

#### The Lum and Brands Patent

The Lum patent relates to the field of producing corrosion resistant phosphate coatings on the surfaces of iron, zinc, and a number of other metals and alloys. Like the Hall patent, the disclosure of Lum is completely unrelated to the passivation technology taught by the present invention. Indeed, the only commonality between Lum and the present invention is the phrase 'activation composition'. In phosphating processes, in particular zinc phosphate, an 'activation composition' refers to the application of very fine, *insoluble* titanium or zinc compounds to metal surfaces to act as nucleation sites for the subsequent zinc phosphate. This has the effect of refining the grain structure of the applied phosphate, making it smaller, and improving the corrosion protection of the phosphate layer.

In a similar fashion, the Brands patent teaches a method to activate metal surfaces prior to zinc phosphating. Brands discloses the preparation of the

reaction product of alkali metal phosphates with 1,1-diphosphonic acids and their alkali metal salts and/or poly(aldehydocarboxylic acids) and their alkali metal salts. As disclosed, these reaction products are then used as titanium salt substitutes for the 'activation' (i.e. grain refinement) of zinc phosphate coatings on various metals and alloys. The supplemental reference of Brown teaches the use of titanium phosphate and oxalic acid to alleviate the problems associated with the large and coarse crystals that result from alkaline cleaning prior to phosphating, while the Schapira patent discloses using alkali and ammonium salts of various phosphoric acids for the purpose of stabilizing a dispersion of Jernstedt salts (titanium salts) to be used as crystal modifiers prior to 'zinc phosphatization'. As with Lum, these additional references relate to phosphating technology and have absolutely no relevance to the present invention.

#### The Komiyama Reference

Regarding the Komiyama reference as an objection to claims 20 and 43, the use of molybdenum disulfide as taught in Komiyama as a lubricant additive is well known. Molybdenum disulfide has been used for decades in oils, greases, aqueous dispersions, extreme pressure formulations and owes its lubricating properties to the lamellar (sandwich) type structure that is similar to graphite. It is important to note that molybdenum disulfide is *insoluble* in water and gains its properties from its unique solid structure. This is in sharp contrast to the use of soluble molybdenum compounds utilized in the present invention that ultimately become a part of the protective oxide layer covering the stainless steel but impart no lubricating properties whatsoever, as contemplated by the present invention. The simple disclosure of a known lubricant by Komiyama does not rise to the level of suggestion necessary to support an obviousness rejection.

In order to highlight this distinction, Applicant has amended claims 20 and 43 to indicate that the passivating composition includes soluble molybdenum. This amendment is supported by the specification in the discussion at Paragraph 25 and in Example 7 at Paragraph 51 in the identification of molybdate dihydrate as a component of the passivation bath, so no new matter has been

incorporated. The soluble molybdenum in the molybdate dehydrate is significantly different from the insoluble molybdenum disulfide of the Komiyama reference so these dependent claims 20 and 43 are non-obvious over the suggested combination of Komiyama with the several other references.

#### The Rodabaugh Reference

The Rodabaugh patent was cited for its disclosure of pickling stainless steel without using nitric acid. As explained in the background of the present application, non-nitric acid pickling methods are known, and the Rodabaugh patent is representative of such methods. Rodabaugh itself discusses earlier pickling processes that do not use nitric acid. However, Rodabaugh does not discuss subsequent passivation of the pickled metal surface or provide any suggestion of following a non-nitric acid pickling step with a non-nitric acid passivation step. In spite of this knowledge of non-nitric acid pickling, neither Rodabaugh nor any of the other references of record disclose or contemplate a process for passivating stainless steel in the absence of nitric acid after pickling treatment in the absence of nitric acid.

#### Conclusion

The primary reference of Hall concerns an organic coating forming composition, not passivation. Lum concerns a composition for phosphate coating, not passivation. Any mention of passivation in any the cited references is tangential. In fact, the only mention of passivation in the Brands patent is in the discussion of an unacceptable comparative example. See, col. 10, lines 3-6. Even if some suggestion can be garnered to combine Hall, Lum, Brands and Rodabaugh to reject the independent claims 1 and 39, the resulting combination still does not disclose passivation. Consequently, the Office action fails to establish a prima facie case for obviousness of claims 1 and 39, or their respective dependent claims 2-38 and 40-43.

It is therefore believed that the claims of the present application are allowable as written. Action toward a Notice of Allowance is earnestly solicited.

Respectfully Submitted,

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